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AN OVERLOOK OF THE RELATIONS OF DUST TO HUMANITY

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In considering the relations of dust to humanity we must not disregard the floating dust of the air, which probably is not brought to the earth except by means other than its own gravity. The "other" means is condensation. The water vapor of the air condenses first on these minute dust particles; thereby our rainfall is gentle and even in character during the shower. Were it not for this feature of nature, every shower would be a terrific cloud burst. The floating dust up to a height of six or seven miles—for moisture does not extend materially higher than cirrus clouds—is one of earth's greatest blessings. If life existed without it, life would be vastly different from what it now is.

The shell of wind-blown dust, as distinguished from the floating dust, is rarely thicker than half a mile. In arid regions where vegetation does not anchor it, wind-blown dust is a mighty physiographic agent. Dust carried more than a thousand miles from the Desert of Gobi fills the channel of the Hoang River, "China's Sorrow," until the bed and banks of the river are higher than the surrounding land. The river cannot clean out its channel; therefore it must make a new one. Seventy-five years ago its waters were poured into the delta of the Yangtse. Then the river broke its banks near Kaifeng. When things were settled the flood joined the Pechili, more than three hundred miles distant. That was merely one instance; for the history of that part of China is a record of the sorrow of Han—all from a single cause—the dust of the Gobi—catastrophic and destructive, not constructive.

In the Plains of this country we have another illustration. The wind-blown dust is delivered in such measure to rivers of the Platte type—"a mile wide, an inch deep, with bottom on top"—that the whole effect is beneficent. Rock waste born of the mountains to the westward is transported, distributed, and levelled.[1] The process is rarely destructive; almost always it is constructive. Billions of tons of mineral matter are yearly taken from a region that is non-productive, and converted into soil which has the potentiality of nutrition and life. But it is dust—all dust.

Now there exists another consideration of wind-blown dust that is confined to thickly-peopled regions where practically all the wind-blown dust is picked up from public streets. A small proportion—pollen, leaf dust, foliage smut, the eggs of insects, and the wing scales of lepidoptera—is gathered from swarded areas. Pollen excepted, the dust of swarded areas is not a menace. At its worst it merely breeds fine crops of infusoria when exposed in water. But wind-swept street dust is a menace to health, perhaps as dangerous as contaminated water.

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[1] The carrying power of the wind varies with the velocity. Double the velocity and the carrying power is increased 64-fold.

Let us assume that finely ground paving substance is the chief part of street dust. If the paving is a rock or brick surface the mineral matter—usually silicious—is sharp edged; therefore it cuts the soft tissues in which it lodges. Particles materially less than 2 micromillimeters in dimension are usually too small to become entangled in lung tissue; particles more than 3 or 4 micromillimeters in size are too large. Therefore size is an important factor. This statement cannot be taken too seriously, however, for it has exceptions.

The character of the dust of public streets is an important factor, and the dust is composed of whatever is dropped there. From the moment when anything reaches the street surface the grinding process begins. The rattan broom of the sweeper is the last instrument in the grinding process; and the process is completed when the cartman tosses the accumulation into the air with his shovel.

Next to paving material, horse dung is the most noteworthy component of wind-blown dust, and its lightest part, the fibrous cellular tissue, is not wholly freed from the soluble biliary part by the action of rain and street sprinkling; it retains a part of the soluble matter and also a rich content of germ life—bacilli, micrococci, and myxobacteria. Among the varieties of germ life most important in ecological science are the bacilli of tetanus and of tuberculosis. Cases of infection by the latter have been reported many times. Cases due to the first-named are rare unless they occur in connection with lacerations. The soil seems to be the home of the tetanus bacillus. A war scare made infected court-plaster, peddled by alleged enemy agents, a premeditated scheme for infection of communities. In evidence cultures of the suspected court-plaster produced tetanus bacilli. So also would anything else soiled by dirty hands. As a matter of fact, for every bacillus found on dirty court-plaster a myriad might be found on the handle of a garden tool, or on the hands of any youngster who plays marbles on the ground. The presence of tubercle bacilli in dust cannot be doubted but the danger from infection from the tubercle bacilli of street dust is slight as compared with the danger from the dust of a room occupied by a tuberculous patient. Nevertheless, dried sputum is a constituent of the street dust of cities, and cases of infection by means of it have been established beyond reasonable doubt. As a matter of fact tubercle bacilli are rarely absent from street dust, and in city streets they are generally the most notable feature of germ life.

The colon bacillus is almost always in evidence in street dust. It is a product of the horse dung content of such dust. The colon bacillus in street dust need not be a cause for alarm *per se*. When found in drinking water, however, there may be danger from the possible presence of typhoid bacilli, because both are characteristic of the enteric tract. As a rule, for every colon bacillus found in a glass of water, about a million find lodgment on articles of food exposed for sale on open street stands. Other forms of germ life a-plenty are constituents of wind-blown street dust but, so far as known, they play merely an insignificant part in the economics of humanity. They need not be considered here.

The foregoing paragraphs present a broad but very elementary view of the ecology of dust. So far as the floating dust of the atmosphere is concerned it is as necessary to life as watery vapor. From a meteorological standpoint the two cannot be considered separately. To assume that either is " foreign matter of the air " is infantile. If the oxygen and nitrogen were removed, the water vapor and dust motes would have the same general movements as the atmosphere as it now is constituted. The only material difference would be that condensation of the water vapor would carry some of the dust particles to the ground. When the water again became a vapor, electrification of the dust particles would project them into the air once more.

Wind-blown dust, however, may be considered very properly as " foreign matter of the air." Wind-blown street dust is disease-bearing. It can be taken out of the air, it is true; so also one may use a 40-ton truck to carry a postage stamp across the street. The real problem is to prevent street dust from getting into the air; and this is not difficult. If hard-paved streets are washed, the water carries to the sewer the dust which brooms cannot gather; and if macadamized and dirt streets are tarred, the dust will not fly from them. Within natural limits a community may have sanitary conditions that are beyond reproach. A community gets the sanitary administration it deserves, however, but not necessarily the one which it needs.

[Another article by Dr. Pedway giving further details of the dust of the Gobi desert will be published in a later number of Ecology.—EDITOR.]